Report Prepared for the Research Division
Royal Commission on National Passenger Transportation

The Potential for Competition in Rail Carriage

Michael K. Berkowitz
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1.0 <u>Introduction</u>

In 1977, VIA Rail was established to take over passenger service from CN Rail and CP Rail. The agreement called for VIA to pay rent to CN and CP for the use of stations, tracks and locomotives. At the same time, VIA was entrusted to maintain its own fleet of passenger cars and to assume direct responsibility for marketing, ticketing, and on-board services. The reason given for the creation of VIA was the concern over mounting subsidies to passenger services. Both CN and CP were reluctant to cross-subsidize passenger service from their freight profits[1].

The hope was that the government could avoid paying large direct subsidies by establishing VIA. The evidence, however, confirms that this has not occurred. According to an Economic Council of Canada report, Minding the Public's Business (1986), in 1985 the subsidy to VIA was $524 million, or $85 per passenger trip, while the average fare was $33 per trip. This subsidy has grown to more than $600 million in 1989[2] with a projection over the next five years to $350 million as a result of service reductions on non-profitable routes, additional revenues being generated on routes such as the Quebec City-Windsor Corridor, and a downsized workforce.

The statement of National Transportation Policy in the National Transportation Act of 1967 states "that an economic, efficient and adequate transportation system making the best use of all available modes of transportation at the lowest total cost is essential to protect the interests of the users of transportation and to maintain the economic well-being and growth of Canada." With the recent cutbacks in VIA's services and growing deficits from operating an obsolescent rolling stock, a new direction is needed to ensure the efficient operation of a passenger rail system in Canada so that this mode can again takes its place as a viable cog within Canada's overall transportation system. One option aimed at achieving this goal is to sell or lease the attractive segments of the VIA network to private carriers with the hope that the profit motivation will lead to the necessary cost and service adjustments that would allow passenger rail to increase its share of the transportation market.

The purpose of this study is to examine the feasibility of this option. In particular we concentrate on three questions. First, what passenger rail markets might be commercially viable, and hence, appealing to private sector carriers? Second, what are the nature of the economies of scale and scope in passenger carriage? In this regard, are the economies of scale and scope in passenger carriage such that the main markets can sustain more than one carrier? Finally, if high concentration does result, is it likely to be a source of concern? That is, will the market power of the operating firm (or firms) be effectively limited either by the threat of new entry or by the competition provided by alternative modes? If not, will government regulation be necessary?

Our examination of these questions concentrated on the Quebec City-Windsor corridor. Our review of VIA's current operations along the corridor suggests that none of the three primary sectors (i.e., Toronto-Ottawa-Montreal, Southwestern Ontario, and Montreal-Quebec City) are profitable nor can they be made profitable with the present capital stock and technology. In order to realize any significant gains to rail's market share and profitability, major improvements in service are required. Adoption of a high-speed rail technology appears to be the only way to achieve the necessary service levels for operating a competitive passenger transportation system. Since the demand for rail services is quite price inelastic, any fare increase associated with the introduction of a high-speed rail system will be more than offset by the value of the time savings to travellers from using this new technology.

Although there have been many cost saving strategies initiated by VIA in recent years, it appears that no route can operate profitably using a high-speed technology without government subsidization for the initial investment in track and rolling stock. One way to assure that the owner of the track does not extend its monopoly power to the provision of the transportation services on the track, ceteris paribus, is for the government subsidy to be specifically directed to the investment in the track. Either no charge or a nominal fee could then be levied on any firm wishing to use the track.

By 2010, each of the corridor routes using high-speed rail are forecasted to generate operating profits with the Montreal-Ottawa-Toronto segment showing the greatest contribution ($145 million), followed by Southwestern Ontario ($10), and Montreal-Quebec City ($4).

While the forecasted use of a high-speed rail system within the corridor is a significant improvement from the current use of rail in the corridor, it is far below that in France and Japan. Like these other countries, the most likely scenario is that a Canadian high-speed rail system would be operated by a single firm with competition provided by other modes. The predicted market share of passenger rail in 2010 is still quite low relative to auto travel within the corridor. Competition from alternative modes appears sufficient to allow the market to discipline the operations of a private monopolist operating the passenger rail system at both the track and transportation service levels if the government chooses to completely withdraw from the passenger rail business. At the same time, having only one firm operate a particular route would be more efficient in terms of avoiding scheduling problems, etc. This more efficient operator would in turn be more competitive with alternative modes and thus represent a more attractive investment from the private sector's standpoint.

The study proceeds as follows: Section 2.0 examines the commercial viability of VIA routes. Section 3.0 looks at the nature of scale economies in passenger rail

transportation while Section 4.0 examines the demand for alternative transportation modes. Section 5.0 explores the natural monopoly question and the need for government regulation. The final section, 6.0, provides a summary and conclusions.

2.0 Commercial Viability of VIA Routes

The purpose of this section is to identify which VIA links within the 1215 km Quebec City-Windsor corridor have the greatest potential to be commercially viable. To do so we shall summarize and comment on the 1989 VIA study, "Review of Passenger Rail Transportation in Canada", which examines the profitability of alternative options within the corridor. We shall also explore the cost reduction recommendations made by Cubukgil and Soberman (1986) in their study, "The Need for Rail Passenger Service and Opportunities for Modal Substitution". Taken together these studies provide a picture of the future profitability of passenger rail service within the corridor and, hence, the potential for privatizing specific links.

2.1 The VIA Study (1989)

The objective of VIA's review of passenger rail service in Canada was: (i) to define and evaluate the possible roles that passenger rail could play in Canada's transportation system and (ii) to identify the measures required for rail to fulfil those roles[3]. The review concentrated on three sectors within the corridor: Montreal-Ottawa-Toronto (MOT), Montreal-Quebec City (MQC), and Southwestern Ontario (SWO). The general conclusion reached in the study was that if current services are continued on these routes, improvements in operations and increased revenue would lead to a reduction of 35% in the annual subsidy required. The report goes on to say that it is also clear that <u>none of VIA's current services have any prospect of covering all its costs over the next 20 years</u>.

The study concluded that a high-speed train from Montreal through Ottawa to Toronto would cut the travel time to three hours (from approximately 5 hours) in that market, and would earn an operating profit in its first year of operation. The high-speed service, according to the report, could attract private investment but up to one-third of the capital cost would likely have to come from government sources.

The review considers four possible roles for passenger rail in arriving at these conclusions. These include a minimum role, the current role, a competitive role, and a maximum role. Table 2-1 summarizes each role within each segment of the corridor. The minimum role reduces service on each segment while the current role maintains present service levels. Neither of these roles would be attractive to the private sector since rail's market share along each route would

likely decrease over time as the present capital stock deteriorated and became increasingly more obsolescent. The competitive role improves service performance, but not likely enough to draw sufficient customers from alternative modes to make rail an attractive private sector investment opportunity. This is because any time-improvements associated with additional capital investment are at least partially offset by the need to share track with freight traffic. The maximum role along each route calls for high speed service along dedicated track. Service time improvements are expected with this role that are sufficient to attract customers from each alternative mode. As we shall see in Section 3.2.2, increased use over any city-pair will allow the firm to operate at a lower point on its average cost curve (referred to as economies of density) and, hence, improve the profitability of the maximum role. We shall come back to this point in Section 5.0 when we look at the additional use of rail with the maximum role undertaken on specific routes and where along the firm's average cost curve the firm might then be expected to operate.

Table 2-2 shows the required investment for each role on each route. The maximum role on each link requires the greatest investment, ranging from $880 million for the Montreal-Quebec City pair to $2.5 billion on the Montreal-Ottawa-Toronto route. In contrast, the recent Ontario/Quebec Rapid Train Task Force Final Report (1991) estimated the capital cost requirement for a 300 KPH system along the MOT route at approximately $3.5 billion ($1990). Moreover, the Task Force Report estimated an annual operating and maintenance cost of $116 ($1990) million compared to the VIA estimate of $115 million[4]. Hence, even in equivalent dollar terms, VIA's cost estimates are low compared to the Task Force's figures for a similar system. In the absence of substantial government subsidization of the capital costs, none of the scenarios examined by VIA and the Task Force are expected to be profitable. Table 2-3 shows VIA's estimated annual operating losses (i.e., not including amortization of capital costs) associated with each strategy. By the year 2010, the maximum role is expected to generate operating (non-inclusive of capital costs) profits on each route, with the greatest positive margin of $145 million on the MOT route. Table 2-4 shows VIA's estimates of the corresponding revenue/cost ratios on each route as of 2010. Again, only the maximum role scenarios have ratios exceeding 1.0 with the MOT ratio being the highest at 2.42. That is, in year 2010, revenues on the MOT route are expected to almost be 2½ times operating costs. As shown in Table 2-5, the operating subsidy per passenger in 2010 would be significantly negative for the maximum role on the MOT route. Finally, Table 2-6 shows VIA's estimates of the market shares with each role. According to VIA, passenger rail's share of the overall market on the MOT route would increase to 22%, from 7%, if the maximum role was adopted.

On a stand-alone basis (i.e., ignoring the 8 year implementation period in which current operations are maintained until the high-speed system is in place), the MOT route yields a real internal rate of return of 3.28%[5]. This is hardly

attractive when long-term Canada bonds are currently offering 10.20%. With a 33% government subsidy ($860 million), the investment is expected to generate an 11% real return[6]. If inflation is assumed to be 5%, the nominal return would be approximately 16%, a high return relative to shareholders of regulated Canadian utilities today. Hence, this subsidy appears higher than necessary to attract private investment.

One way to improve the profitability of high-speed rail scenario, and reduce the subsidy, is to reduce the annual costs of operating the system.

2.2 Cubukgil and Soberman Study (1986)

Cubukgil and Soberman (hereafter C&S) discuss alternatives directed toward reducing the costs of operating a passenger rail system within the corridor. Although many of these initiatives have been undertaken by VIA since the 1986 C&S study, it is informative to identify them so that similar inefficiencies will not be built into the institutional arrangements of a privatized system. According to C&S, VIA's current (at the time) cost structure is inflated due to certain inefficiencies in the system. These inefficiencies stem, in part, from institutional problems that provide VIA with little control over its costs and the railways with little incentive to improve operating efficiency. C&S go on to say that another contributing factor is VIA's own management.

While many of the comments directed at VIA by C&S may not apply to a private firm operating a specific passenger route within the Quebec City-Windsor corridor, they should be kept in mind when negotiating the terms of a privatization. That is, if regulation of the private firm is necessary (we shall discuss this point in Section 5.0), the process should provide incentives for the firm to reduce its costs and pass on those savings, at least in part, to consumers. The new firm should also not be straddled by contracts for services with other firms which lack incentives for the efficient provision of those services.

C&S discuss a number of inefficiencies in the present system which should be avoided in any new arrangement. First, the railways perform train and line-haul operations on behalf of VIA under operating agreements, and pass on full costs of those services in accordance with CTC costing regulations. Under these arrangements, VIA is currently not in a position to negotiate specific charges for functions performed by the railways. If VIA were given the freedom to negotiate fixed-price contracts there may be significant opportunities for reducing railway charges.

Current train crew costs are another concern of C&S. The major factors contributing to high crew costs are wages arising from outdated work rules and overstaffing of train crews. Under the existing costing arrangements, the railways

have no incentive to either negotiate for reasonable work rules with their unions or to improve crew scheduling practices. They simply pass their costs on to VIA.

Another area for significant cost savings is equipment maintenance. According to C&S, VIA's lack of direct control over maintenance performed by the railways has been central to problems with equipment maintenance. Under current contractual arrangements, it is difficult for VIA to influence the railways to modify maintenance practices, because of a lack of incentives by the railways to improve efficiency. An option to the present arrangement is for the newly established private firm to enter into maintenance contracts directly with the railways or it may perform maintenance operations itself.

C&S also criticised linehaul-related costs being dictated to VIA by CTC regulations. In their opinion, the freedom to negotiate fixed-price contracts directly with the railways for running its trains on railway infrastructure would produce significant savings.

The overhead burden is pointed out by C&S as perhaps the single largest problem facing VIA. The administrative costs the railways pass on to VIA are in accordance with CTC regulations and are estimated to account for approximately 35 percent of all railway charges in the corridor. This means that existing costing regulations allow the railways to mark up the direct charges (excluding capital) by more than 60 percent which C&S believe to be excessive. C&S argue that if direct charges could be reduced in accordance with their targets ($4.50 per train-kilometre) and the overhead contribution reduced from 60 percent to 20 percent, administrative charges on the corridor could be reduced from $5.70 per train-kilometre to $1.40 per train- kilometre. This represents a 75 percent reduction in these costs which account for 35 percent of all railway charges in the corridor.

In order to determine whether any of these cost reducing strategies have been undertaken by VIA subsequent to the 1986 study by C&S and to determine the magnitude of the actual cost reductions, we contacted Mr. Gabor Matyas, Project Leader, Strategic Planning, VIA. Mr. Matyas informed us that since the time of the C&S study, commercial agreements (mostly with CN) have been instituted with respect to linehaul charges whereby fixed-price contracts are now negotiated. Since VIA is a captive market, however, the agreements probably remain somewhat one-sided in favour of CN. Presently, the linehaul charges represent only about 10% of VIA's base compared to over 60% in 1986. That is, 90% of all costs are under VIA's control today. The problem still exists regarding on-board crew costs since negotiations to change the present agreements with the union for VIA employees must be similarly undertaken for freight crews. According to Mr. Matyas, although substantial cost reductions have been realized since 1986 through the adoption of negotiated contracts with the railways, the levels have been far below the forecast of Cubukgil and Soberman[7].

Whether 20 percent or a somewhat higher figure is a reasonable overhead contribution and whether the $4.50 per train-kilometre is also reasonable is a cost accounting exercise beyond the scope of the present study. What is important is that any new arrangement with a private firm to run a section of the corridor not hamper the ability of the firm to realize the potential savings outlined by C&S.

Although C&S argue that full cost recovery of present corridor services is possible through a combination of cost reductions, fare increases, ridership increases, and if necessary, service changes, a substantial government subsidy is still necessary to induce private investment in corridor operations.

Table 2-1

Description of VIA Strategies

Role	MOT	SWO	MQC
Minimum	Restricted svc. Longer journey times than under Current role.	Svc. reduced substantially.	Svc. substantially reduced. Express svc. eliminated resulting in longer times than Current role.
Current	Existing svc. levels maintained as are market shares. Operating costs reduced through replacement of equipment and other prod. improvements.	Existing svc. levels maintained as are market shares. Operating costs reduced through replacement of equipment and other prod. improvements.	Existing svc. levels and mkt. shares maintained.
Competitive	Improved svc. levels and speed subject to constraint of track sharing with freight.	Maximizes train performance on Toronto-Windsor, Toronto-Sarnia, and Toronto-London routes.	Maximizes train performance between Montreal and Quebec City. Reduces trip time on this route by 25 minutes.
Maximum	Svc. improved beyond what is possible with shared track. New dedicated track required. Technological leap required for financial success. Current role continued for 7.5 years during implementation of high-speed service.	Hybrid consisting of 8 yrs. of current operation on existing routes followed by 12 yrs. high-speed operation along a new alignment.	Offers fast, frequent svc. between Montreal and Quebec City. Hybrid consisting of 8 yrs. of current operation on the north and south shores, followed by 12 yrs of high-speed operation on the north shore.

Table 2-2

Required Investment on Alternative VIA Strategies

Role	MOT	SWO	MQC
Minimum	$33 m. for equipment renewal over next 20 years.	$21 m. to replace rail diesel car in early 1990's and $30 m. around 2007 to replace locomotives.	$8 m. for equipment renewal in 1995.
Current	$220 m. over next 20 years to replace fleet.	$225 m. over next 20 years for new equipment and maintenance.	$20 m. for fleet replacement between 1992 and 1994.
Competitive	$375 m. over next 20 yrs. to replace rolling stock, add new locomotives, and track work.	$375 m. between 1991 and 1995 for equipment renewal, new locomotives, infrastructure improvements, etc.	$270 m. for equipment renewal, track upgrading, etc. on the north shore.
Maximum	$2.5 b. for high-speed train (TGV-type).	$1.6 b. for high-speed electric trains operating on dedicated track.	$880 m. for high-speed electric trains operating on dedicated tracks.

Table 2-3
Operating Losses With Alternative VIA Strategies
(million $)

	MOT		SWO		MQC	
Role	1990	2010	1990	2010	1990	2010
Minimum	95	53	55	34	18	12
Current	122	70	57	32	24	17
Competitive	122	57	58	43	24	9
Maximum	120	(145)	58	(10)	25	(4)

Table 2-4

Revenue/Cost Ratios for Alternative VIA Strategies (2010)

Role	MOT	SWO	MQC
Minimum	.30	.34	.27
Current	.57	.64	.41
Competitive	.68	.65	.76
Maximum	2.42	1.18	1.10

Table 2-5

Operating Subsidy/Passenger on Alternative VIA Strategies ($) (2010)

Role	MOT	SWO	MQC
Minimum	67	33	64
Current	24	12	44
Competitive	20	11	11
Maximum	(39)	(5)	(4)

Table 2-6

Market Shares (%) With Alternative VIA Strategies (2010)

	MOT		SWO		MQC	
Role	Total	Public	Total	Public	Total	Public
Minimum	2	7	3	14	1	7
Current	8	21	10	37	3	17
Competitive	10	29	13	58	9	44
Maximum	22	51	16	66	13	68

3.0 Scale Economies in Passenger Rail Transportation

This section examines the nature of scale economies in passenger rail carriage in order to infer whether the profitable operation of any VIA route can be sustained with more than one carrier operating on the route. Although the answer to this question depends upon both the size of the market and the cost structure of the industry, we shall focus in this section only on the latter. Further, because the preponderance of work aimed at estimating the degree of scale economies in this industry has concentrated on the provision of freight services, our review of the literature will reflect this dominance and we shall try to draw inferences from the studies of freight service to passenger rail carriage.

3.1 The Cost Structure of Rail Transportation

One explanation offered for the steady decline in passenger rail volume throughout North America is the comparative cost differentials that exist between rail and other modes of passenger transportation. In an early study, Meyer, et al. (1959) found that among public transportation alternatives, the bus had a cost advantage on short runs and even the airplane costs no more than rail coach service on long runs. Another study on modal cost differences was done by Brandes and Lazar (1966). These authors concluded that the Southern Pacific Railroad's day trains between Los Angeles and San Francisco had unit costs twice as high as air or bus competitors, making it impossible for the railroad to compete on a cost basis.

Keeler (1971) also examined the relative cost of passenger rail service and, contrary to previous researchers, found that on short hauls passenger trains are cost competitive with other modes and in many cases may have lower costs. The difference between his results and those of previous authors is due, according to Keeler, to the failure of the earlier authors to standardize for the quality of service between alternative modes. Even though quality-adjusted rail costs were found to be competitive with the costs of other modes, Keeler argued that railroads have costs substantially higher than necessary because of their own failure to invest in equipment appropriate for short hauls and also because of outmoded work rules. Although Keeler's 20 year old admonition of the industry may very well apply to VIA today, the purpose of this section is to examine the nature of the scale economies in the industry that might be further utilized, if they exist, to improve the competitive performance of passenger rail in Canada.

In order to better understand the nature of the economies of scale and scope in the provision of passenger rail services, a brief description of the cost structure of passenger rail transportation is necessary.

An important and somewhat unique characteristic of the production facilities in the railroad industry is that they are lumpy and indivisible. In order to provide rail service between points A and B which are 1000 kilometres apart, 1000 kilometres of track must be provided. Moreover, in all other transport modes except pipelines, the basic capital stock - the right-of-way - is publicly provided and owned. If a new trucking company, for example, begins operation, it is not necessary for the firm to first provide a highway system. The provision of railroad services, however, does require the provision of the necessary right-of-way. Because rail carriers provide their own right-of- way and because efficient operation requires high volumes of traffic, it is not surprising that the rail industry is not more competitive. This leads us to suspect that greater competition might be expected in this industry if firms did not have to provide their own right-of-way, but could rent it at reasonable rates (much like the payment of highway taxes).

Inherent in the cost structure of the railway industry are joint and common costs which affect the nature of the scale economies. Joint costs arise when the production of one good eventually leads to the production of another good in fixed proportion. In the railroad industry, each trip results in a corresponding return trip. Common costs, on the other hand, arise when the facilities used to produce one good are employed in the production of other goods. In the railroad industry the same rail cars can be used for different routes and the same track can be part of many different routes. It is important to recognize that both joint costs and common costs are not easily traceable to the production of specific services and that both costs exist in the railroad industry. This has lead to a great deal of confusion in the literature when estimating the cost structure of the industry.

In order to understand whether the railroad industry is characterized by increasing, constant or decreasing costs, it is important to distinguish between two different kinds of economies of scale - economies of size and economies of density. Economies of size refers to the slope of the long-run average cost curve as the size of the firm - measured by the entire capital stock of the company - increases. The presence of economies of firm size, or increasing returns, means that the larger the firm, the lower the per unit cost of output. Whether returns to size exist or not depends on the net effect between the cost complementarities (i.e., common costs) and the diseconomies resulting from more fixed costs, e.g., extra scheduling, etc. as a result of adding more track or more trains.

Economies of density, on the other hand, are scale economies resulting from an increase in traffic volume, keeping the amount of track fixed. That is, if an increase in traffic density, keeping the amount of track constant, results in lower average cost per unit of output, economies of density are said to exist. The firm has three options for changing the volume of traffic. It can change the number of passengers on each train, the number of trips per train or the number of trains.

The product of these three factors yields a measure of total passengers served which can be interpreted as a gauge of traffic density over a specific route. A common measure of traffic density in freight transport is revenue ton miles per mile of track while in passenger carriage the usual measure is passengers carried per mile of track.

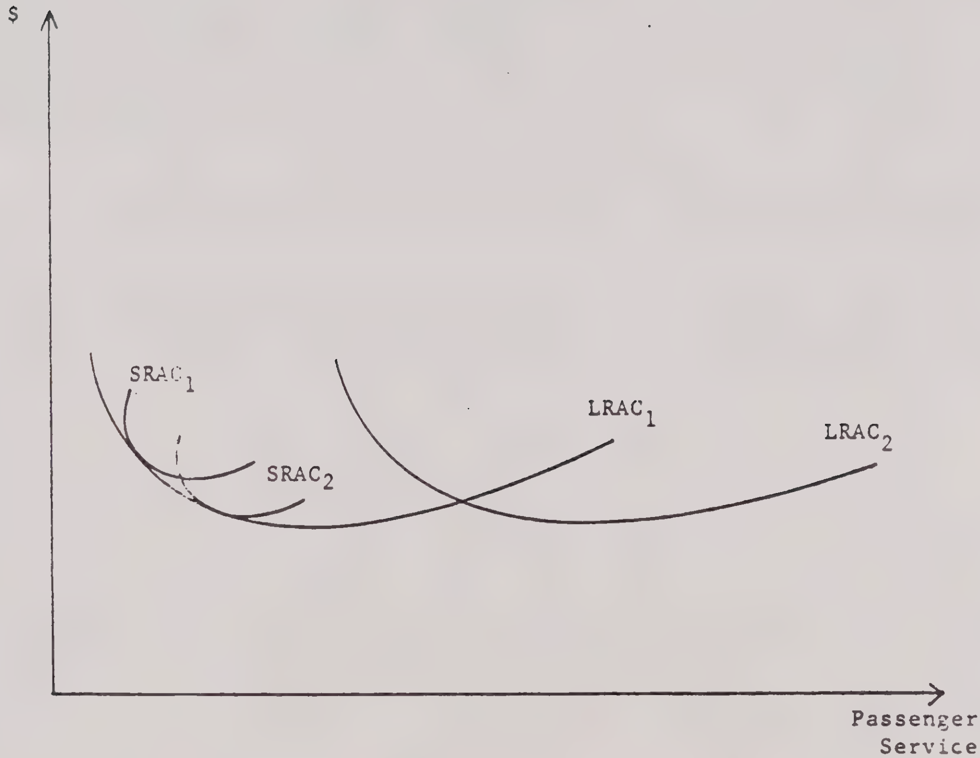
Figure 3-1 illustrates the two forms of scale economies. We assume that the track has a higher degree of "fixedness" than does rolling stock based upon physical installation and secondhand marketability. As traffic density increases due to more passengers per train and/or more trips per train, a movement occurs along a specific short-run average cost curve (e.g., $SRAC_1$). An increase in the number of trains, however, results in a shift to a new SRAC curve (e.g., $SRAC_2$). Groups of SRAC curves are bounded below by the LRAC curve corresponding to a specific length of track (e.g., $LRAC_1$). An increase in total track results in a shift to a new LRAC curve (e.g., $LRAC_2$). In the context of this model, local economies of density imply negatively sloped SRAC and LRAC curves at a given output. Economies of size suggest that the curve bounding the LRAC curves is negatively sloped in the relevant region.

Economies of scope exist when it is less costly to produce products together than separately. For example, if a firm produces two different goods (q_1,q_2), scope economies exist when SC is greater than one, where:

$$SC = [C(q_1,0) + C(0,q_2) - C(q_1,q_2)]/C(q_1,q_2)$$

and $C(\cdot,\cdot)$ is the cost function. A railroad can be thought of as a multiproduct firm since it offers many routes to its customers as well as the choice of passenger and freight carriage. These multiple products, moreover, share much of the same capital. Hence, the potential for economies of scope certainly exists in this industry. Whether railroads exhibit economies of scope or not depends upon the net effect between the complementarities of producing more than one product and the diseconomies associated with the production of multiple products. As with scale economies, whether the net effect is positive or negative is an empirical issue which we shall now address by reviewing the relevant literature.

FIGURE 3-1



3.2 Evidence of Scale and Scope Economies

3.2.1 Economies of Size

Keeler (1974) and Caves, Christensen and Tretheway (1980) have shown that the long-run average cost curve for freight services is horizontal for firms operating with more than 500 miles of track. Over this range of output, railroads

appear to exhibit constant returns to size. According to Bonsor (1984), all recent econometric studies of railroad cost functions show that economies of scale (size) are either absent or very modest in size for the larger railroads.[8] For smaller railroads (operating with less than 500 miles of track, for example), Griliches (1972) and Charney, Sidhu and Due (1977) have suggested that increasing returns to scale may prevail.

In one of the more recent studies examining both freight and passenger traffic in Canada, Freeman, Oum, Tretheway and Waters (1985) examined economies of firm size. The authors concluded that there were constant returns to firm size for both services. In contrast to much of the earlier work in the literature, Kim (1987) found substantial scale economies for both passenger services and freight services in the U.S. with the passenger scale economy measure approximately twice the measure for freight. This lead him to conclude that railroad firms were inclined to expand their operations in passenger services relative to freight services. Kim also found that there were mild overall returns to size for both products.

3.2.2 Economies of Density

Even in the absence of economies of firm size, increasing returns to traffic density could give rise a natural monopoly situation. That is, along a specific route it may be more efficient for a single firm to handle the existing traffic than for two or more firms. With increasing returns to density, competition will force the inefficient firms out of business.

In one of the earliest works to address the issue of density economies, Borts (1960) found economies of density for southern and western U.S. railroads, but diseconomies for eastern railroads. Meyer and Kraft (1961) pointed out that Borts' method of allocating costs between freight and passenger traffic on the basis of gross-tonne miles overstates freight costs and understates passenger train costs. This would have overestimated the freight costs on the more passenger intensive eastern railroads, thus giving rise to diseconomies rather than economies in that region.

Following the work of Borts, Healy (1962) showed that density economies existed up to a density of about 3 million revenue tonne-miles of freight per mile of track. According to Cubukgil (1987), however, Healy's results were also likely to have been biased due to the measurement of output in terms of total revenue (i.e., from passenger and freight services). Since high-density routes tend to be more passenger intensive, Healy's results would have underestimated output, or underestimated unit costs, on the routes where railways were experiencing substantial losses from passenger operations. Thus, density economies at the higher end of the scale could have gone undetected.

Later work by Friedlaender (1971) and Keeler (1974) concluded that there were substantial economies of traffic density for most U.S railroads in the provision of freight carriage. Harris (1977) also found significant economies of density in U.S. railroads providing freight services. He showed that as density (measured by revenue ton-miles per mile of track) increased, total cost per revenue ton-mile decreased. The decline was most pronounced as traffic volume increased from one-half million revenue ton-miles per mile of road to 4 million revenue ton-miles per mile of road. The decline in average cost occurred, moreover, irrespective of the type of traffic carried. Harris estimated that one-third of the density economies were due to declining average capital costs and the remainder resulted from declining fixed operating costs such as crew, engines, maintenance, etc.

The existence of significant economies of density was also confirmed by Spady (1978) and Levin (1981). Levin suggested, moreover, that the consistent findings among researchers implies that very few, if any, rail links in the U.S. have the traffic density sufficient to support a large number of competing firms with independently owned and operated track.

Braeutigam, Daughety and Turnquist (1984) estimated a long run cost function for freight carriage by a single, large U.S. railroad firm using time series data. The authors include a quality of service variable in their estimates of the firm's cost function. They concluded that there are strong economies of density and earlier studies which have omitted a quality of service variable have underestimated the extent of the economies of density in the system.

In a more recent study, Caves, Christensen, Tretheway, and Windle (1985) argued that the earlier evidence on density economies was much less clear-cut than the authors of these studies implied. This was due to their failure to account for unobserved network effects. Caves et. al. attempted to overcome this shortcoming and in doing so they confirmed the results of most of their predecessors, i.e., increasing returns to density and constant returns to scale. In contrast to other studies, however, these authors also found no tendency for returns to density to diminish at higher levels of density.

In Canada, Freeman, Oum, Tretheway and Waters (1985) also found positive returns to traffic density in both passenger and freight traffic. The authors ran several different models and the estimates for traffic densities consistently confirmed their existence. Although the evidence strongly suggests the existence of density economies, it does not follow that the surviving firm will be able to extract all the monopoly rents. We shall come back to this point in Section 5.0.

3.2.3 Economies of Scope

Economies of scope exist when it is cheaper to produce two products together rather than separately. In the railroad industry, joint production may involve passenger and freight carriage, different routes, different types of passenger or freight service and any combination thereof. Since a railroad's output is so diverse, it is necessary to examine whether a natural monopoly will exist for the multiproduct firm. For a multiproduct natural monopoly to exist, there must be scope economies as well as product-specific scale economies.

Cubukgil (1987) makes a useful distinction between two types of economies of scope - horizontal scope economies and vertical scope economies. For horizontal scope economies, the joint products can be any set of the above examples, e.g., first-class and coach service. For vertical scope economies, the products are track capacity and transportation services.

3.2.3.1 Horizontal Scope Economies

In a review of the literature, Keeler (1983) notes:

> "At low densities, different types of freight share both trains and track. As more commodity types are carried on a given route, they are carried at lower costs, because trains are longer and the tracks are better utilized. And as increases in any one commodity type allow for longer trains and better plant utilization, scale economies as well as economies of scope result."

As Cubukgil (1987) points out, the evidence presented by Keeler does not necessarily suggest anything more than increasing returns to density. The reasons railroads expand their output mix is to generate sufficient traffic to utilize their available capacity, and not necessarily to take advantage of any scope economies in joint production.[9]

The lack of horizontal scope economies in the types of freight services offered is consistent with the evidence found regarding the joint provision of freight and passenger services. Kim (1987) has presented convincing evidence on the existence of diseconomies of scope in the case of passenger and freight carriage. Kim found that the scope economies between freight and passenger services was approximately -.410, implying that the costs of providing passenger and freight carriage separately would be 41 percent less than the cost of producing them jointly. The presence of diseconomies of scope suggests that the complementarities associated with the joint provision of freight and passenger carriage are outweighed by the diseconomies associated with additional scheduling problems, etc. The diseconomies of joint production in this case are sufficiently

large so as to more than offset the complementarities of joint production. We would expect similar scheduling problems and, hence, diseconomies, with the joint operation of a single passenger route by competing firms, without the added benefit of the cost complementarities.

3.2.3.2 **Vertical Scope Economies**

The vertical distinction treats the provision of track capacity separately from the provision of the transportation services on the track. Because of the fixed infrastructure associated with the provision of track capacity, scale economies would most certainly be realized by the owner of these assets. Moreover, the sunk nature of these costs would almost assure an uncontested natural monopoly. The firm owning the track capacity, due to its monopoly power, can sell its output or use it to engage in the next stage of production. If the former option was chosen, the provision of transportation services would be subject to hit-and-run entry and competition from alternative modes so that even if scale economies existed at this level, the natural monopoly would be contestable. In contrast, the owner of the track might extend its monopoly power to the provision of the transportation services. As long as the firm is uncontested at the track end, it can continue to provide transportation services as an uncontested natural monopoly as well.

Whether the vertical integration that we observe in most railroads has been a conscious industry decision due to scope economies or simply an historical artifact with no economic basis is not clear. There are certainly too few examples of the separation of the two outputs to provide any rigorous comparison of production costs. Perhaps the more relevant question, however, is not whether an uncontested natural monopoly exists or not, but if it does exist, will competition from alternative modes be sufficient to discipline the firm from exercising its monopoly power? In Section 5.0 we argue that the alternative modes will provide significant competition to passenger rail in the corridor. A second consideration is that since a government subsidy is required to attract private participation in this investment, government ownership of the track and right-of-way satisfies the necessity of a subsidy and prevents any single firm from extending its uncontested natural monopoly in track capacity to the transportation service.

4.0 **The Demand for Alternative Transportation Modes**

The question remains whether lower costs would attract sufficient passengers to make rail service on specific routes profitable. An accurate answer would require a route demand study to determine where sufficient load factors can be achieved. In lieu of this, we shall present some overall empirical evidence of the demand elasticities for passenger rail and its competing modes for intercity travel - bus, air and auto.

An early paper by Gronau (1970) showed evidence that lower costs could substantially expand the market for passenger rail service. Gronau analyzes the value a traveller must place on his time if he is to take a given mode. His analysis is based on a cross-section of thirty-eight city pairs in the U.S. northeast. Gronau concludes:

> Air transportation does not save any time relative to rail as long as the distance of the trip is less than 135 miles. The public transportation travel market for trips of less than 135 miles is, therefore divided between the bus, which services low-income passengers, and rail, which serves high-income passengers. Air carriers become an effective competitor only for travel exceeding 135 miles, cutting sharply into the rail's share of the market. Rail is squeezed out of the market when the distance of the trip exceeds 176 miles. When the distance is 176 miles, a passenger prefers rail to bus only if his price of time exceeds $4.70 per hour. However, if his price of time exceeds $4.70 per hour, he prefers air to rail, resulting in the elimination of rail from competition.

All this is postulated on air fares exceeding rail fares which in turn are higher than bus fares. Tables 4-1 and 4-2 show this to be the situation for the VIA corridor routes. Table 4-1 presents the minimum one-way fares given in Cubukgil and Soberman (1986) for each mode on each route while Table 4-2 gives the corresponding present economy-class fares. From each table, air fares are significantly higher than rail fares which, in turn, are marginally higher than bus fares. If railroads were able to offer service price-competitive with buses and faster as well, says Gronau, they should be able to extend their market beyond the 176 mile range, and also capture more of the market below 176 mile. Table 4-3 shows that bus has far more weekly departures than rail and air departures exceed rail on most corridor routes. Table 4-4 shows that the minimum service time for air travel along the corridor routes is also much lower than rail times.

This would suggest that a price-competitive and time competitive service offered on the Ottawa-Toronto, Montreal-Toronto, and Toronto-Windsor routes (i.e., greater than 300 kilometres) might be able to capture more of the bus and air market shares. Let us not overlook, however, that we are talking here about the public transportation market and the automobile dominates the corridor routes as shown in Table 4-5. According to VIA (1989), the automobile dominates all modes between city pairs within the corridor, with market shares ranging from 41% on the Montreal-Toronto link to 89% on the Toronto-Kingston link. Air's stronghold is Montreal-Toronto with a 39% market share, while the bus mode's forte is Quebec City-Montreal- Ottawa with a 13% market share. Rail's share of the total

market ranges from 2% in the Montreal-Quebec City segment to 15% in the Montreal-Toronto link. Rail is the predominant public mode for Toronto-Kingston (58%), Toronto-Windsor (51%), and Toronto-London (49%).

4.1 <u>Demand Elasticities for Alternative Modes</u>

As we examine demand elasticities for passenger rail and alternative intercity competitive modes it is important to recognize that a demand elasticity greater than one (in absolute terms) for rail indicates that a fare cut will increase overall revenue. Note, however, that even if the demand elasticity is less than one, lower costs might make passenger trains profitable.

Keeler (1971) indicates that the available evidence for intercity non-business passenger rail travel consistently yields demand elasticity estimates greater than one. More recent studies by Kroes and Sheldon (1988) using U.K. data (-1.40) and Morrison and Winston (1985) using U.S. data (-1.20), among others, confirm an elasticity greater than one for non-business usage. This is significant since Table 4-6 shows that most trips on rail, and overall, taken in the corridor are for non-business use. For business usage we would expect the demand elasticities to be less than for non-business usage since the value of time is higher for the business traveller.

Tables 4-7 through 4-10 summarize demand elasticity estimates derived by various researchers for business and mixed business/leisure intercity rail, air, bus, and auto. The mixed business/leisure use estimates for each mode are significantly above the business use only estimates for all modes. Furthermore, in each table there are more mixed estimates than business-only estimates. Hence, the mean elasticity estimates for each mode are likely quite close to the elasticity estimates reflecting overall usage in Table 4-6. For intercity passenger rail travel, Table 4-7 shows that the mean demand elasticity is -.742, suggesting that an overall fare cut will <u>decrease</u> total revenues. On the other hand, a fare decrease directed toward non-business travellers would likely increase revenues. Looking at Table 4-8, the mean demand elasticity for air travel is -.882. Like passenger rail, it appears that business air travel is inelastic while non-business usage is quite elastic. As Table 4-9 shows, similar characteristics apply to intercity bus travel except that the overall demand is much more inelastic (-.557) than both air and rail. Finally, Table 4-10 provides a sample of demand elasticity estimates for auto travel. Again, the demand elasticity for non-business use of the automobile is higher than for business use, but unlike the other modes, it is inelastic. Overall, the demand for intercity auto travel is highly inelastic (-.278).

Oum and Gillen (1983) have estimated cross-elasticities for public passenger transport modes using Canadian data for selected years between 1961-76. Table 4-11 confirms our premonition that there is virtually no substitution between rail

and air as a result of possible fare changes. However, significant time reductions in passenger rail service would induce the switch from air to rail. On the other hand, because trip times are similar on bus and rail routes within the corridor, a rail fare decrease may cause bus users to switch to rail. Although Oum and Gillen do not consider the cross-elasticities between the public transport modes and auto travel, we expect the cross-elasticity of demand between rail and auto to be very low due to the time advantage accorded auto travel. Again, we would expect gains in rail's market share if the travel time using rail could be reduced sufficiently to be competitive with air and auto.

Table 4-1

Minimum Fares of Alternative Modes on VIA Corridor Routes

Route	Distance (km)	Minimum One-Way Fares: Rail	Bus	Air
Quebec-Montreal	252	25.00	24.25	100.00
Montreal-Ottawa	187	18.00	14.95	59.00
Ottawa-Toronto	446	39.00	32.00	49.00
Montreal-Toronto	539	44.00	35.70	59.00
Kingston-Toronto	254	26.00	21.95	70.00
Toronto-Windsor	359	42.00	25.75	110.00
Toronto-Sarnia	280	26.00	-	106.00
Toronto-London	185	18.00	13.80	90.00

Source: Cubukgil and Soberman (1986).

Table 4-2

1991 Fares of Alternative Modes on VIA Corridor Routes

Route	Distance (km)	1991 One-Way Fares Rail	Bus	Air
Quebec-Montreal	252	34.00	30.92	191.59
Montreal-Ottawa	187	28.00	22.00	175.57
Ottawa-Toronto	446	59.00	42.75	215.64
Montreal-Toronto	539	68.00	48.10	245.41
Kingston-Toronto	254	41.00	28.84	191.59
Toronto-Windsor	359	51.00	37.56	195.03
Toronto-Sarnia	280	42.00	34.29	192.74
Toronto-London	185	30.00	20.22	174.42

Source: VIA, Air Alliance, Air Canada, Air Ontario, Canadian Pacific, Voyageur, Greyhound, and Gray Coach.

Table 4-3

Weekly Frequency of Alternative Modes on VIA Corridor Routes

Route	Distance (km)	Weekly Frequency Rail	Bus	Air
Quebec-Montreal	252	82	349	130
Montreal-Ottawa	187	72	262	234
Ottawa-Toronto	446	52	138	337
Montreal-Toronto	539	108	69	360
Kingston-Toronto	254	188	144	64
Toronto-Windsor	359	68	116	96
Toronto-Sarnia	280	56	-	43
Toronto-London	185	193	202	108

Source: Cubukgil and Soberman (1986).

Table 4-4

Minimum Service Times of Alternative Modes on VIA Corridor Routes

Route	Distance (km)	Minimum Time (hrs.) Rail	Bus	Air
Quebec-Montreal	252	2.8	3.1	0.7
Montreal-Ottawa	187	2.1	2.3	0.6
Ottawa-Toronto	446	4.1	4.5	0.9
Montreal-Toronto	539	4.8	6.8	1.1
Kingston-Toronto	254	2.2	3.0	0.8
Toronto-Windsor	359	4.2	5.0	0.8
Toronto-Sarnia	280	3.3	-	0.8
Toronto-London	185	2.3	2.3	0.6

Source: Cubukgil and Soberman (1986).

Table 4-5

Market Shares of Alternative Modes on VIA Corridor Routes

Route	Rail Total/Public	Bus	Air	Auto
Quebec-Montreal	2.2/13.0	13.3	2.3	82.2
Montreal-Ottawa	3.8/21.2	13.4	0.7	82.1
Ottawa-Toronto	4.1/11.4	9.2	22.7	64.0
Montreal-Toronto	14.8/25.2	4.7	39.2	41.3
Kingston-Toronto	6.6/57.5	3.9	0.9	88.5
Toronto-Windsor	12.4/50.8	7.7	4.4	75.6
Toronto-Sarnia	8.9/63.4	2.2	3.0	85.9
Toronto-London	7.5/49.1	5.5	2.2	84.8

Source: VIA (1989), "Corridor Demand Forecasts: Final Results".

Table 4-6

Trips By Purpose on VIA Corridor Routes

Route	Rail Trips (%) Business	Rail Trips (%) Non-Business	Total Trips (%) Business	Total Trips (%) Non-Business
Quebec-Montreal	42.4	57.6	45.0	55.0
Montreal-Ottawa	31.5	68.5	34.1	65.9
Ottawa-Toronto	22.3	77.7	33.0	67.0
Montreal-Toronto	16.5	83.5	43.8	56.2
Kingston-Toronto	18.4	81.6	18.8	81.2
Toronto-Windsor	6.7	93.3	18.1	81.9
Toronto-Sarnia	10.2	89.8	25.4	74.6
Toronto-London	32.0	68.0	23.1	76.9

Source: VIA (1989), "Corridor Demand Forecasts: Final Results".

Table 4-7

Demand Elasticities for Intercity Rail Travel

MODE	ELASTICITY ESTIMATE	COUNTRY	SOURCE
Rail	-.86	U.K.	Fowkes, Nash and Whiteing (1985)*
Rail	-.77 to -.90	U.K.	Glaister (1983)*
Rail	-.315	U.S.	Grayson (1981)*
Rail	-.70	U.K.	Kroes and Sheldon (1988)
Rail	-.86	U.S.	Morrison and Winston (1983)*
Rail	-.37 to -.40	Ireland	McGeehan (1984)
Rail	-.572	U.S.	Morrison and Winston (1985)
Rail	-1.080 to -1.538	Canada	Oum and Gillen (1983)*
Rail	-.77 (Avg.)	U.K.	Jones and Nichols (1983)*
Rail	-.69 to -1.08	U.K.	Owen and Phillips (1987)*
Rail	-.67	U.K.	Jones and Nichols (1983)*
MEAN	**-.742**		

* Mixed business and leisure.

Table 4-8

Demand Elasticities for Intercity Air Travel

MODE	ELASTICITY ESTIMATE	COUNTRY	SOURCE
Air	-.7635 to -.8425	U.S.	Agarwall and Talley (1985)*
Air	-.910	Greece	Andrikopoulos and
Air	-.820	Norway	Fridstroom and Thune-Lane (1989)*
Air	-.618	U.S.	Grayson (1981)*
Air	-.26	U.S.	Morrison and Winston (1983)*
Air	-.181	U.S.	Morrison and Winston (1985)
Air	-1.116 to -1.277	Canada	Oum and Gillen (1983)*
Air	-1.71	U.S.	Brown and Watkins (1974)*
Air	-1.8 to -3.1	U.S.	Jung and Fugii (1976)*
Air	-1.10	U.S.	Oum and Gillen (1981)
MEAN	**-.882**		

* Mixed business and leisure.

Table 4-9

Demand Elasticities for Intercity Bus Travel

MODE	ELASTICITY ESTIMATE	COUNTRY	SOURCE
Bus	-.252	U.S.	Benham (1982)
Bus	-.321	U.S.	Grayson (1981)*
Bus	-.45	U.S.	Morrison and Winston (1983)*
Bus	-.315	U.S.	Morrison and Winston (1985)
Bus	-1.275 to -1.615	Canada	Oum and Gillen (1983)*
MEAN	**-.557**		

*Mixed business and leisure.

Table 4-10

Demand Elasticities for Intercity Auto Travel

MODE	ELASTICITY ESTIMATE	COUNTRY	SOURCE
Auto	-.076	U.S.	Grayson (1981)*
Auto	-.237 to -.311	Australian	Hensher and Smith (1986)*
Auto	-.83	U.S.	Morrison and Winston (1983)*
Auto	-.699	U.S.	Morrison and Winston (1985)
Auto	-.21	Canada	Berkowitz et. al. (1990)
MEAN	**-.278**		

* Mixed business and leisure.

Table 4-11

Selected Estimates of Cross-Elasticities

	Air	Bus	Rail
Air	-	-.02 to -.01	.01 to .04
Bus	-.12 to -.05	-	-.47 to -.21
Rail	.08 to .51	-1.18 to -.17	-

Source: Oum and Gillen (1983).

5.0 **Natural Monopoly and Regulation**

One of the reasons typically given for regulating public utilities (i.e., telephone companies, pipelines, and natural gas distributors, etc.) is the natural monopoly characteristics of these particular industries. That is, economies of scale may exist with market demand insufficient to support more than one firm. Even though the methods of production and technology are common knowledge, no new firm would enter the industry. The economic alternatives are one profitable producer or two unprofitable ones.

While the general conclusion to be drawn from the literature is that there are constant returns to firm size in passenger rail with the current technology, significant economies of density have also been confirmed. Increasing returns to density, however, is not a sufficient condition for the single firm to behave as a monopolist. As long as there are no barriers to entry, or exit, and free access to the same technology, the single firm will operate under the threat of "hit-and-run" entry. This will make the firm a contestable natural monopoly[10], imposing the same discipline on the firm as would perfect competition. In determining the likelihood of "hit-and-run" entry, Cubukgil (1987) draws the distinction between two factors contributing to density economies in rail operations.

First, there are scale economies involved in line-haul operations.[11] The empirical evidence on this issue is scarce. However, Cubukgil argues that operational considerations suggest that crew, fuel and even switching costs decline with train size. Further, as traffic volumes increase, railways have the opportunity to utilize their equipment more effectively, reducing both the capital and maintenance costs of rolling stock. At higher densities, therefore, railways

can perform line-haul operations more efficiently. However, even if such density economies were sufficient to lead to a natural monopoly along a specific route, there is nothing in the nature of the line-haul operations that would pose an entry or exit barrier. The resources committed in the rail carriage business are quite mobile, allowing the firm engaged in rail carriage to exit without incurring significant costs. Suppose, for example, that two separate firms operated contiguous routes, e.g., Toronto-Ottawa and Ottawa-Montreal. Absent collusion, the threat of entry by the other firm would force each firm to act competitively and not extract monopoly rents from consumers.[12]

The second source of density economies arises from the fixed costs associated with the infrastructure (i.e., the right-of-way and track). These costs are sunk and, hence, inhibit free exit. While much of the fixed asset base is old and largely depreciated, from the standpoint of contestability, it is the replacement cost of these assets that is relevant - not their book value. Any new firm would have to invest a large sum in the basic infrastructure in order to enter the market. In view of the difficulties associated with acquiring new right-of-way and the magnitude of the required investment, the barrier is probably insurmountable. Thus, these density economies give rise to an uncontested natural monopoly.

It is apparent from the VIA (1989) study that none of the segments within the Quebec City-Windsor corridor can generate a profit using the present day technology. The only prospect for profitability lies in the adoption of a high-speed rail technology, accompanied by a government subsidy. Since we were unable to find any studies of economies of size and density for high-speed rail, we must make inferences from the evidence examined with the current technology. That is, it appears that density economies will be realized along the privately operated high-speed rail route. Moreover, these density economies may lead to an uncontested monopoly if the firm operating the line also owns the right-of-way and track.

If a private sector firm does operate a specific corridor route, one way to possibly overcome the lack of a contestable market is for the government to lease the track to any firm wishing to operate on the route. In this scenario, the firm(s) would own the rolling stock. One problem not overcome in this situation is that a rival firm would likely not be able to imitate the cost structure of the incumbent. Hence, the market would still not be contestable. This is due to the diseconomies associated with more than one passenger carrier competing on a single route. An analogy can be drawn from what has been observed with passenger and freight traffic sharing the same railway. We know from Section 3.2.3 that the diseconomies between passenger and freight, due to scheduling problems, are sufficiently large to cause overall diseconomies of scope for these services. Moreover, it is doubtful that as long as the rolling stock was owned by the firm

that there would be sufficient mobility of this capital to allow "hit-and-run" entry, another impediment to the contestability of the market within this scenario.

On the other hand, if the government also owned the rolling stock, it would be bearing additional risk as well as greater potential future involvement in the industry. In this case, since little risk is borne by the operating firm(s), problems of moral hazard arise with the government acting as guarantor.

Alternatively, the uncontested natural monopolist might be regulated by the government. In order for the company to have the flexibility to compete effectively and generate attractive returns for its shareholders, the government should adopt an incentive or social contract form of regulation. Briefly, incentive regulation is a modified form of rate of return regulation. In this method, the regulator allows the company to keep a portion of the excess returns above the allowed return. Both the company and the customers share the excess profits which allows the company to improve its earnings directly and thus encourages the company to reduce costs and increase its revenues. Alternatively, social contract regulation involves a contract between the company and the regulator for a specific period of time. Among other things, the contract sets out the rates to be charged for the company's services over the contract period. Notable is that the company's rate of return is not regulated. The most popular form of social contract regulation is price cap regulation. This method places a ceiling on the rate increases the company can charge its customers. The ceiling is typically tied to inflation less an adjustment for productivity increases. These regulatory methods provide incentives for the company to improve its productivity and profitability and allow the company to compete more effectively in a more competitive market.

Is this form of discipline necessary? What we have not considered to this point is the competition facing the rail operator from alternative modes. If we look at Table 5-1, we see that for the 300 KPH service, the forecasted number of annual trips in the corridor in 2010 is 7.79 million. Of that number, 1.62 million are in the Quebec-Montreal segment; 3.82 million in the Montreal-Ottawa-Toronto segment; and 1.72 million in the Toronto-Windsor segment.[13] According to the VIA (1989) report, rail accounted for .69 million trips in 1988 along the MOT segment. Hence, within this segment, the forecasted increase is over 450%. Yet even with this enormous percentage increase, the projection of 7.79 million is far short of the 125 million riders per year on the Japanese National Railway's bullet train[14] and 17.3 million users in 1988 on the TGV Sud-Est in France.[15] Hence, the private Canadian firm is not likely to be operating at as low an average cost as its counterparts in France and Japan. The alternative modes in the corridor are, therefore, more likely to provide greater competition to the high-speed rail operator. This is supported by the data in Table 5-2 where we see that the projected market share of the 300 KPH high-speed rail system is only 6.4% in 2010. There is still expected to be strong competition from air (1.9%), bus (4.1%) and especially auto (87.5%). It is unlikely that regulation is necessary given these projections.

Table 5-1

Ridership Forecast in Year 2010 By Option and Segment

(Millions)

Route	200 KPH	300 KPH	400 KPH
Quebec-Montreal	.93	1.62	2.78
Montreal-Ottawa-Ottawa	2.10	3.82	4.70
Toronto-Windsor	1.29	1.72	2.45
"Inter-segment" travel[1]	.68	.62	1.54
Total[2]	5.00	7.79	11.47

1. Toronto-Trois-Rivières, for example.

2. Rounded totals

Source: Ontario/Quebec Rapid Train Task Force Final Report

Table 5-2

Total Modal Share by Option

Mode	Base Year (1987)	200 KPH (2010)	300 KPH (2010)	400KPH (2010)
Rail				
Million	3.38	5.00	7.79	11.47
Percentage	(3.6%)	(4.2%)	(6.4%)	(9.3%)
Air				
Million	2.67	2.59	2.34	2.21
Percentage	(2.8%)	(2.2%)	(1.9%)	(1.8%)
Bus				
Million	3.51	5.09	4.99	4.89
Percentage	(3.7%)	(4.3%)	(4.1%)	(4.0%)
Auto				
Million	85.26	107.02	106.00	104.62
Percentage	(89.9%)	(89.4%)	(87.5%)	(84.9%)
Total Trips (Millions)	94.62	119.70	121.09	123.20

Source: Ontario/Quebec Rapid Train Task Force Final Report (1991)

6.0 Summary and Conclusions

The purpose of this study was to examine the profitability of VIA's Quebec City-Windsor corridor routes in order to assess whether any specific segment, or the entire corridor network, could be operated by a private firm. The nature of scale economies was explored in order to predict the structure of the newly formed industry and possible need for government regulation.

Our examination of VIA's current operations along the corridor suggests that none of the three primary segments (i.e., Toronto-Ottawa-Montreal, Southwestern Ontario, and Montreal-Quebec City) are profitable nor can they be made profitable with the present capital stock and technology. In order to realize any significant gains to rail's market share and profitability, major improvements in service are required. Adoption of a high-speed rail technology appears to be the only way to achieve the necessary service levels for operating a competitive passenger rail

transportation system. Since the demand for rail services is quite price inelastic, any fare increase will be more than offset by the value of the time savings to travellers on a high-speed rail system.

Although there have been many cost saving strategies initiated by VIA since the 1986 study by Cubukgil and Soberman, it does not appear that any route can operate profitably using a high-speed technology without government subsidization for the initial investment in track and rolling stock. Determination of the size of a reasonable subsidy is beyond the scope of the present study, but consideration must be given to the explicit and implicit subsidies given to competing modes as well as the social benefits and costs of having a high-speed rail system operating within the corridor. Examination of successful high-speed rail operations in other countries confirms that government subsidization, in one form or another, is the rule rather than the exception. The advantage of directing the subsidy by the government to investment and ownership of the track is that no private firm could extend its uncontested natural monopoly position vertically to the provision of the transportation services on the track, ceteris paribus.

By 2010, each of the corridor routes using high-speed rail are forecasted to generate operating profits with the Montreal-Ottawa-Toronto segment showing the greatest contribution ($145 million), followed by Southwestern Ontario ($10), and Montreal-Quebec City ($4).

The forecasted number of trips with a 300 KPH passenger rail system on the entire corridor in 2010 is 7.79 million. While this is a significant improvement from the present use of rail on the corridor, it is far below that in France and Japan. Like these other countries, in the most likely scenario, a Canadian high-speed rail system would be operated by a single firm with competition provided by other modes. The predicted market share of passenger rail in 2010 is 6.4%, compared to 87.5% for auto travel within the corridor. Competition from alternative modes appears sufficient to allow the market to discipline the operations of a private monopolist operating the passenger rail system at both the track and transportation service levels if the government chooses to completely withdraw from the passenger rail business. At the same time, having only one firm operate a particular route would be more efficient in terms of avoiding scheduling problems, etc. This more efficient operator would in turn be more competitive with alternative modes and thus represent a more attractive investment from the private sector's standpoint.

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ENDNOTES

1. See Brander (1988), p. 247.

2. Via Annual Report, 1989.

3. See VIA (1989), "Review of Passenger Rail Transportation in Canada", Supplementary Volume 1, Approach, pg. 3.

4. See Ontario/Quebec Rapid Train Task Force Final Report (1991), Table 4.13, pgs. 4-23.

5. Over the entire corridor, the Task Force (1991) estimated an internal rate of return of only 0.4% on the 300 KPH line.

6. The assumption is that the entire $860 million subsidy is granted in 1990. If the subsidy is allocated over the 8 year investment period, it would be larger and account for 50% of the investment costs.

7. It should be recognized that VIA's 1989 "Review" used these new cost arrangements in their cost projections for their different scenarios.

8. Friedlaender and Spady (1981) have provided some evidence of decreasing returns which could be attributed to managerial diseconomies.

9. In fact, standardization of the firm's output mix would appear to simplify operational requirements and even reduce certain costs.

10. See Panzar and Willig (1977).

11. See Miller (1973) for a discussion of these density economies.

12. Let us not overlook, moreover, the competition from alternative modes, as well, which will probably be an even greater disciplining agent. We shall address this issue later on in this section.

13. These forecasts are very close to those made by VIA (1989). VIA estimated 3.74 million annual trips in 2010 on the MOT segment; 1.78 million on the SWO segment; and 1.13 million on the MQC segment.

14. See Meyer and Oster (1990), pg 193.

15. See Ontario/Quebec Rapid Train Task Force Final Report (1991), pg 3-5.